chapter six

Substance Use Careers and Antisocial Behavior: A Biosocial Life-Course Perspective

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KEY TERMS
Heritable Latent trait Psychopathy Substance use Substance dependence

INTRODUCTION
Data from a variety of sources over time and in different societies demonstrate a highly stable association between substance abuse and crime. The use and abuse of, and dependence on, psychoactive intoxicants are present in a large proportion of antisocial behaviors, including offenses against person and property. Indeed, a survey of the American Society of Criminology professional membership regarding the causes of serious and persistent offending found that alcohol and “hard drugs” are perceived to be just as important as family factors, lack of educational opportunities, and impulsiveness, and more important than labeling, low IQ, and biological factors. A recent survey by the Bureau of Justice Statistics indicated that approximately 33 percent of adult inmates committed their offense while under the influence of drugs, and over half of the adult inmates were using drugs in the month previous
to their offense. Approximately 17 percent of state inmates and 18 percent of federal inmates reported that they had committed an offense to obtain money for drugs.¹

Substance abuse is also predictive of recidivism and decreases the likelihood of cessation from offending. Studies of juvenile offenders consistently demonstrate that problematic substance use and delinquent acts are intertwined. For example, in a study of a statewide population of juvenile offenders, Michael Vaughn and colleagues found that high rates of past drug abuse and property and violent offending clustered together at both the low and high ends of the use spectrum; youth who used the most drugs also possessed extensive offending histories. In a landmark study of 1,829 youth in detention facilities in Chicago, Linda Teplin and associates found that approximately half of males and females had a diagnosable substance use disorder.²

In addition to the linkages between drug use and crime, there are enormous social costs, with the majority of the economic burden attributable to crime and criminal justice. These costs include government crime control (e.g., law enforcement and police protection), incarceration, social services, and loss of productivity of victims. The range of services across these domains is great. Also, there are costs related to emergency room care and ongoing medical care for injuries sustained during violent encounters where alcohol or drug intoxication was a precipitating factor. Although estimates vary, the economic costs are clearly well over $100 billion annually.³

In general, the relationship between substance use and crime is reciprocal.⁴ This is because the context of crime and substance use is shared or overlapping. This is not to say that all criminals abuse drugs or that drug users inherently possess a propensity for crime, although many do. From a comorbidity perspective, this may be a spurious relationship due to an unmeasured or unobserved "third" variable, such as a latent trait like psychopathic personality or low self-control that increases the risk for both substance use and crime. Other researchers claim that both drug abuse and crime are part of a general deviance pattern or problem behavior spectrum.⁵ Although research consistently shows a link between substance use careers and crime, a more focused theoretical understanding of the causal mechanisms is warranted.

How best to define patterns of substance use vary. Some advocate that the terms "abuse," "addicted," or "dependence" be changed to "substance misuse" or "to the troublesome use of substances."⁶ One contemporary definition that succinctly captures the essence of addiction was developed by George Koob, who defined drug addiction as follows: "Drug addiction, also known as substance dependence, is a chronically relapsing disorder characterized by (1) a compulsion to seek and take the drug, (2) loss of control in limiting intake, and (3) emergence of a negative emotional state (e.g., dysphoria, anxiety, irritability) when access to the drug is prevented (defined here as dependence)."⁷ One can readily see the implications for crime inherent in this definition given the compulsion to seek out drugs and corresponding loss of self-control.

One of the most common conceptualizations is a continuum of severity beginning from use to abuse and finally to dependence. This conceptualization is used in the Diagnostic and Statistical Manual of Mental Disorders of the American Psychiatric Association.
for differentiating two hierarchical disorders: abuse and dependence. Both disorders are characterized by maladaptive patterns of use and clinical distress. To be diagnosed with abuse, the individual must meet at least one of the following four criteria in a 12-month period (and have never met criteria for dependence): (1) recurrent substance use resulting in a failure to fulfill major role obligations at work, school, or home; (2) recurrent substance use in physically hazardous situations; (3) recurrent substance-related legal problems; and (4) continued substance use despite having recurrent social or interpersonal problems attributable to substance use.

**Substance dependence**, the more severe form of substance use disorders, requires three or more of the following criteria to be met in the same 12-month period: (1) tolerance; (2) withdrawal; (3) taking the substance in larger amounts or over a longer period of time than intended; (4) persistent or unsuccessful effort to cut down or control use; (5) spending a great deal of time to obtain the substance, use the substance, or recover from its effect; (6) important social, occupational, or recreational activities are given up or reduced because of substance use; and (7) substance use is continued despite knowledge of having a persistent physical or psychological problem that is likely to have been caused or exacerbated by the substance. It should be noted that in this chapter we refer to problematic substance use generally, which includes both abuse and dependence. A substance refers to a wide range of products used to get high, including alcohol, drugs, and other types of medicines.

**SUBSTANCE CAREERS AND BIOSOCIAL LIFE-COURSE THEORY**

The goal of this chapter is to highlight the relationship of substance use to crime across the life course by using a "career" perspective. Although it is statistically quite normal to drink alcohol and experiment with drugs at some point across the life course, usually during adolescence, the substance abuse-crime connection can be advanced by using a career approach similar to that advanced by career criminal researchers. The reason for this reflects the reality that substance abuse and crime are not evenly distributed across the population or across the life course. Birth cohort studies, longitudinal studies, and research from the biopsychological sciences have shown that a small subset of the population accounts for most antisocial behavior. As such, this chapter examines those factors across the life course that initiate, amplify, and maintain a substance use career in relation to forms of antisocial behavior. But first, those factors that serve as fundaments for understanding the vulnerability to substance abuse and crime, such as genetics and neurological and personality facets, are examined. In addition, the reward pathway in the brain is discussed because of its pivotal role as a mechanism for compulsive substance seeking. Although there are many factors to consider, such as the political economy of substances, which influence their availability, a discussion of distal governmental and market forces is beyond the scope of the present chapter.

**Are Some Persons More Vulnerable to a Substance Abuse Career?**

Behavioral genetics and neuroscience, two complementary research areas, have together provided a foundation for the contemporary understanding of problematic substance use
career vulnerability. Twin studies indicate that approximately 50 to 60 percent of the variation in substance use disorders is heritable. Several genes have also been found to be associated with behavior disinhibition and substance dependence, including dopamine (e.g., DRD4) and GABAergic (e.g., GABRA1) receptor genes.\textsuperscript{10} Much of the recent understanding and conceptualization of addiction as a brain disease has been facilitated by the rise of neuroimaging procedures, such as functional magnetic resonance imaging. These techniques allow direct comparisons of substance using and nonusing individuals. Findings indicate clear differences in biochemical, structural, and functional processes in the brain that influence decision making, control, and even craving. Persons with developmental deficits in critical areas of the prefrontal cortex are vulnerable to dysregulation in inhibitory control and are at higher risk for substance-related crime, perhaps even more persistent and severe forms of offending. It has long been recognized that deficits in and trauma to areas of the frontal lobe result in aberrant and aggressive behavior characterized by marked reductions in behavior monitoring. These systems, although not fully understood, act as “brakes” for physiological and psychological impulses in the face of reward or stimulus.\textsuperscript{11}

Personality can be defined simply as characteristic ways of thinking and behaving. Neurological substrates (coded for by various genes) comprising inhibitory control provide the building blocks for personality. Given the close association between genes and neural substrates, approximately 40 to 50 percent of the variance in personality can be attributed to genes. It seems probable that individual propensity to violence and vulnerability to substance abuse share many biological substrates. Certain personality traits are important factors in their relation to substance abuse and criminality. In fact, antisocial personality disorder—the psychiatric diagnosis found in the \textit{Diagnostic and Statistical Manual of Mental Disorders IV} (DSM-IV) most associated with violence, criminality, and alcohol and drug use disorders—is associated with the personality trait of novelty seeking. Novelty seeking has much in common with other constructs shown to be related to both crime and drug abuse, including sensation seeking and impulsivity. In a study using the five-factor model of personality (NEO-PI-R), Terracciano and colleagues found that low conscientiousness, which is also associated with psychopathic personality, was associated with multiple forms of illicit drug use.\textsuperscript{12}

Two constructs that have received much research attention by criminologists and psychologists are low self-control and psychopathy. Self-control theory in criminology gained prominence with Michael Gottfredson and Travis Hirschi’s \textit{A General Theory of Crime}. Since then, the low self-control construct has garnered much research attention and empirical support.\textsuperscript{13} However, the concept of self-control is nothing new. In its various guises (e.g., self-regulation, neurodisinhibition, impulsivity), self-control constructs are quite common across the behavioral sciences. Individuals low in self-control can be generally described as impulse driven, self-centered, insensitive to others, hot-tempered, irresponsible, and prone to risky behaviors. With respect to substance abuse and dependence, Baler and Volkow stated “Importantly, there seems to be intimate relationships between the circuits disrupted by abused drugs and those that underlie self-control.”\textsuperscript{14}

\textbf{Psychopathy}, or psychopathic personality, may be one of the oldest psychiatric personality constructs shown to predict violence and other forms of antisocial behavior among adults and juveniles.\textsuperscript{15} Psychopathy is also convergent with career criminality.\textsuperscript{16}
Psychopathy can be defined by its various behavioral, emotional, and cognitive dimensions that express themselves as an inability to form warm bonds with others, low empathy, high manipulativeness, deception, callousness, sensation seeking, and poor impulse control. Overall, antisocial personalities are highly convergent with one another and typically comorbid with substance use disorders. Thus it is quite typical for antisocial persons to have extensive substance use careers spanning many years.

The Reward Pathway: A Key Mechanism for Understanding Substance Abuse and Crime

Research has demonstrated major differences in the brains of addicted persons and non-addicted persons. The reward pathway, also known as the mesolimbic reward system, is one of the major neural circuits that is profoundly altered in the brains of addicted persons. This system is pivotal due to its role in survival, providing positive reinforcement for eating, drinking, sex, and other functions that are basic to survival. The reward pathway therefore has its roots in our evolutionary past. In the course of substance misuse, chemicals flood the reward pathway to supernormal levels, well beyond the effects of aforementioned food and sex. Thus this neural circuit becomes “hijacked” and compulsive substance seeking ensues. The usual inhibitory control mechanisms are overwhelmed, particularly in those persons with structural or functional deficits in this area of the brain. Substances of abuse and dependence are known to increase levels of dopamine within the brain. Dopamine facilitates communication between receptors in the brain involved with heightened states of joy and physiological arousal. Drugs such as cocaine, methamphetamine, nicotine, and opiates activate dopamine in the nucleus accumbens. Neuroimaging studies found low numbers of type 2 dopamine receptors (i.e., DRD2) to be associated with heightened vulnerability to substance dependence. Conversely, it has been hypothesized that higher levels may exert a protective benefit or shield from substance use careers.

Overall, two frontal areas of the reward system (anterior cingulate and orbitofrontal cortices) are compromised in substance-dependent individuals. These findings are critical because these regions have been implicated in inhibitory control. Variations in the sensitivity of these systems due to polygenic factors and neural deficits influence the response to drugs of abuse and the vulnerability to an extended substance abuse career. These variations possess profound impacts over the life course.

Prenatal and Early Developmental Factors

Research has shown that having an antisocial parent or substance-abusing parent heightens the risk transmission of substance dependence and delinquent involvement. Although there is commonly discussion about whether genes or environment are the primary mechanism, both are certainly involved. How can drugs of abuse cause harm to the newborn? Although we know very little about maternal behavior with respect to substance abuse and behavior, there are several ways in which this can happen. Women who themselves have had extensive substance use careers or are currently abusing substances are more likely to smoke during pregnancy and place their infants in risky situations.
An accidental or intentional blow to the head of a fetus or newborn can cause subtle damage, resulting in deficits in inhibitory control, which is critical to executive governance later in life. Several studies have also found that maternal cocaine exposure can interrupt caregiving behaviors and perhaps harm early attachments.20

Adrian Raine pioneered research on the early developmental pathways and risk factors leading to antisocial behavior in adulthood. Numerous studies by Raine found low physiological arousal or autonomic functioning, typically measured by heart rate at rest and under stressful demand, has shown to be predictive of antisocial behavior in childhood. Raine and colleagues found that birth complications, such as low birth weight, low Apgar score, and lack of oxygen, are predictive of later violence. These birth complications interact with family factors in heightening the vulnerability to antisocial behavior.21 Research is needed to assess the strength of these factors in relation to the formation and maintenance of substance abuse careers.

Childhood
There has been a greater amount of research on the childhood manifestations of early conduct problems that have important implications for the origins of substance use careers across the life course. Because antisocial behavior is multifaceted, researchers often identify risk factors for antisocial behavior across levels of analysis such as the individual, family, peer, and community. At the individual level these include early externalizing behaviors, low IQ, hyperactivity, and low behavioral inhibition. Family and peer risk factors include parental psychopathology, familial antisocial behaviors, maltreatment, peer rejection, and deviant peer affiliations. School and community risk factors are poor academic performance, concentrated disadvantage, and access to weapons. Determining how these risk factors interact to produce antisocial phenotypes, including the initiation of early substance misuse, is a major challenge.

It appears that early behavioral problems indicative of prefrontal disturbances are predictive of later dependence on psychoactive substances. In a long running investigation, the Dunedin birth cohort study, Avshalom Caspi and colleagues found that observational reports of 3-year-old boys described as impulsive, easily distractible, and prone to negative emotions were three time more likely to be alcohol dependent in early adulthood.22 Other studies found that externalizing problems in childhood was instrumental in setting a course toward alcohol use problems, including dependence in adulthood. Similarly, deficits in neurobehavioral control scores, at ages 10 to 12 among low- and high-risk boys in a longitudinal sample, were found to predict substance use disorder with a high accuracy. This construct was based on a pool of affective, behavioral, and cognitive indicators. Item response theory methods pointed to a single latent trait termed “neurobehavioral disinhibition.” Conversely, the decision to terminate a substance use career was predicted by low neurodisinhibition scores.23

Adolescence
Adolescence is a period characterized by greater independence and, as such, experimentation with substances. The start of most substance use careers occurs during this period of
adjustment between childhood and adulthood norms and expectations. The adolescent brain is not fully formed, and thus decision making associated with risk appraisal and impulse drives are often compromised during this developmental transition period. Decisions typically involve satisfying immediate emotional needs rather than following intellectually based decision making that considers a range of possible consequences. Brain systems that subserve impulses and risk are further along in development than those that involve control. For those adolescents who already possess prefrontal disturbances and are in contact with environmental pathogens, such as deviant peers or substance using family members, substance abuse careers become a greater possibility.24

The origins of delinquent behavior and substance use are linked in decades of research, thus indicating similar etiologies such as those previously discussed. Adolescent juvenile offenders also initiate their substance use career earlier than nondelinquents, and court-referred youth use and abuse substances at rates higher than nonreferred youth. Further, illicit substance abuse heightens the risk for future referrals. Finally, substance use careers and crime among adolescent juvenile offenders involve comorbid mental health disorders, including attention deficit hyperactivity disorder, anxiety, and depression.25

There have been several investigations of psychopathy in adolescence and substance abuse. In a study of adolescents using the Psychopathy Checklist Revised-Youth Version (PCL-YV), Mailloux et al. found that the total scores of this measure, indicating higher levels of psychopathic behavior, were significantly related to higher scores on the Michigan Alcoholism Screening Test, Drug Abuse Screening Test, age at initiation, and numbers of drugs tried.26 Another study of substance abuse treatment by O'Neill, Lidz, and Heilbrun showed that higher PCL-YV scores were associated with a lower percentage of clear urine screens and fewer consecutively clean urine screens.27 These findings, as with the data on violence, parallel the research on adult samples of antisocial and psychopathic offenders.

Adulthood
Most studies of substance abuse and crime are based on samples of persons diagnosed with antisocial personality disorder.28 Fewer investigations focused more narrowly on the relationship of psychopathy to substance use disorders. Empirical findings indicate that problematic substance use tends to go hand-in-hand with antisocial personality and psychopathy in particular. This finding is unsurprising given that sensation seeking, impulsivity, risk taking, and failure to plan ahead characterize both syndromes. Problematic substance use, career offending, and psychopathy are important to study conjointly because their etiologies appear to be intertwined, and thus insight into one may lead to greater knowledge about the other. Also, because both are so highly associated with aggression, another reason to study this relationship is the hope that it may lead to more effective interventions in children and adolescents at the earliest stages possible.

A key question in the research on substance use careers is this: What are the long-term consequences of substance abuse and dependence? In a 33-year study of a community sample of 581 male heroin-dependent persons, Hser, Hoffman, Grella, and Anglin found that nearly half (48.9 percent) had died prematurely, with the majority of death attributable to overdose or poisoning, chronic disease, liver disease, homicide, accidents,
and suicide. A similar study of substance use careers among 5,168 persons (approximately 40 percent arrestees) found that alcohol, tobacco, marijuana, and crack/powder cocaine were the most prevalent substances used, often in conjunction. In both studies over half of study participants had used substances throughout the follow-up periods.

CONCLUSION

Can understanding the biosocial foundations of substance use careers be reconciled with the popular Goldstein tripartite framework? The answer is yes. In 1985, Paul Goldstein published an influential article organizing the “drugs/violence nexus” occurring around three domains: psychopharmacological, economically compulsive, and systemic. This typology was developed inductively based on data collected in New York City on substance abuse and its behavioral effects. The first of these phenomena, psychopharmacological, is related to violence due to the direct effects that drugs have on the brain. The second major domain of the drugs/violence nexus is termed economically compulsive, which is simply the result of drug-dependent persons engaging in robberies to provide cash to buy more drugs. The final level, systemic, refers to violence perpetrated as a part of the operation of drug markets and the business of distributing illegal substances. Because substance abuse hijacks the reward system in the brain and there is a corresponding need to continue to reinforce this pathway, there is simultaneously a relationship between Goldstein’s psychopharmacological and economic-compulsive domains. Thus these two areas of the framework are intertwined. The systemic domain certainly provides the context for the availability of drugs of abuse, yet it is the neurobiology of addiction that provides the ongoing fuel for systemic violence associated with substance abuse.

Substance use careers and crime are inextricably linked. The causal structure is inherently complex and dynamic. Their association involves biological processes that occur at different levels of organization and that are linked to an ecological habitat and developmentally sensitive periods. The vulnerabilities to a substance use career and crime are not fully understood. In general, the more extreme the substance use or criminal career, the greater the likelihood for convergence between the two. Greater research on the convergence between career criminal and addiction careers is warranted. Considering the disproportionate involvement in crime among a subset of persons, illuminating the overlap would be useful for both clinical and policy arenas.

Historically, the evidence associated with the widespread use of psychoactive agents across cultures and time suggests that the human species seeks to alter consciousness. Seemingly, the ingestion of both natural and synthetic chemicals, and resulting behavioral changes among humans, is an ever-present danger. Although some psychoactive substances (e.g., marijuana) are less likely to lead to crime, and some (e.g., alcohol and cocaine) more likely identifying effective management methods is important and would likely benefit from a foundation of sound empirical evidence that is interpretable within a biosocial framework.

A recent conceptualization that facilitates the theorizing of the reciprocal relations between drug abuse and crime is a general biosocial liability model that denotes risk across a continuum. Vaughn reviewed research and theory and developed a synthesis that is
useful for directing and organizing findings and concepts that range from the biological (dispositional) to the environmental (proximal and distal contextual). Because the phenomenon of substance abuse careers and crime extends across multiple disciplinary fields, a transdisciplinary theoretical synthesis is needed. Without such a synthesis, a lack of biological–environmental interplay, which can lead to isolated findings not linking together, is a potential consequence. Explaining substance use careers and crime strictly in terms of a singular disciplinary focus is folly. Future experimental and prospective studies that combine behavioral genetics, neuroscience, and psychosocial factors are necessary to begin to build causal-based intervention knowledge.\footnote{Notes}

GLOSSARY

Heritable—the proportion of variance in a measure that is accounted for by genetic factors

Latent trait—personality traits that can be measured on a continuum

Psychopathy—a personality disorder that characterizes people who are egotistical, self-centered, impulsive, exploitative, lacking in remorse, and emotionally callous

Substance use—a continuum of severity beginning from use to abuse and finally to dependence

Substance dependence—a severe form of substance use disorder that is typified by tolerance for the substance, difficulty quitting, and withdrawal symptoms

NOTES


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